DEPARTMENT OF ENVIRONMENTAL QUALITY
PERMITTING and COMPLIANCE DIVISION
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM (MPDES)

Statement of Basis (SOB)

Permittee:	City of Boulder
Permit No.:	MT0023078
Receiving Water:	Boulder River
Facility Information:	Boulder Wastewater Treatment Facility (WWTF) 35 Muskrat Lane Boulder, MT
Mailing Address:	P.O. Box 68 Boulder, MT 59632
County:	Jefferson
Contact:	Gary Craft, Mayor
Telephone:	(406) 225-3381
Fee Information:	
Type:	Minor Publicly Owned Treatment Works
Number of Outfalls:	1 (for fee determination purposes)
Type of Outfall:	001 – Facility Discharge (Existing WWTF) 01A – Facility Discharge (New WWTF)

I. Permit Status

The current MPDES permit for the City of Boulder (City) Wastewater Treatment Facility (WWTF) was issued on January 12, 2010, became effective March 1, 2010, and expires on February 28, 2015. The permit was modified (minor modification) on January 30, 2013.

The Montana Department of Environmental Quality (DEQ) received an application for renewal of the permit on May 27, 2014. By letter of July 23, 2014, DEQ considered the application for renewal to be substantially complete.

II. Facility Information

Current Facilities:

The Boulder WWTF serves the City of Boulder, with a current population served of approximately 1,445 people (NPDES Application 2A, dated May 22, 2014). The WWTF is a three-cell facultative lagoon with a total volume of 29.6 million gallons constructed in 1967 and earlier. The design flow of the WWTF is 0.25 million gallons per day (mgd) and the total surface area of the lagoon system is 18.7 acres.

Discharge from the WWTF is intermittent, with discharge typically occurring nine to ten months per year, from April through December or January. Effluent is discharged from a pipe to the Boulder River through Outfall 001 at approximately 46º13'29" N latitude, 112º06'12" W longitude. The facility does not provide disinfection of the effluent.

Construction has commenced on a new activated sludge WWTF for the City that will replace the existing lagoon system. The new WWTF, scheduled for completion in June 2015, will have a design flow of 0.18 mgd and consist of the following elements: headworks consisting of screening and influent flow measurement; influent lift pumps; aeration basins; polishing basins; two secondary clarifiers; aerobic sludge digestor; sludge drying beds; ultraviolet light (UV) disinfection of the effluent and effluent flow measurement. The new WWTF will continuously discharge from the effluent disinfection facility to the Boulder River. The City has applied for approval to discharge from the new WWTF to the receiving water at relocated Outfall 001 (renamed Outfall 01A) at approximately 46º13'33.5" N latitude, 112º06'44" W longitude.

The present WWTF will continue to discharge from the existing lagoon system through Outfall 001 (001) until the new WWTF is operational and commences discharge through Outfall 01A (01A). Discharges through 001 and 01A will not occur simultaneously and 001 will be eliminated when the new WWTF is deemed to be operating correctly.

The existing WWTF is located in the 100 year flood plain of the Boulder River and will be demolished and the site reclaimed upon completion of construction of the new WWTF.

Table 1: Current City of Boulder WWTF Design Criteria Summary*	
Facility Description: Three-cell Facultative Lagoon.	
Construction Date: 1967 and earlier	Modification Date: None
Design Population: 1,665	Current Population: 1,445
Design Flow, Average: 0.25 mgd	Design Flow, Maximum Day: NA
Design BOD Load: 283 lb/day	Design TSS Load: 333 lb/day
Total Surface Area: 18.7 acres	Total Volume: 29.6 million gallons
Number of Cells: 3	Detention Time @ Design Flow: 118.4 days
Collection System: Separate	Infiltration/Inflow: 0.04 mgd
Disinfection: No	Type: NA
Discharge Method: Intermittent	

*Information from MPDES Applications dated May 22, 2014 & April 13, 2009, including Technical Memoranda from Stahly Engineering received April 14, 2009; Department files; SOBs of November 2009 and January 2013 (minor modification).

Table 1A: New City of Boulder WWTF Design Criteria Summary* - est. June 2015 Completion	
Facility Description: Activated sludge mechanical plant with effluent disinfection.	
Construction Date: 2015	
Design Population: 1,590	Current Population: 1,445
Design Flow, Average: 0.18 mgd	Design Flow, Maximum Day: 0.40 mgd
Design BOD Load: 285 lb/day	Design TSS Load: 315 lb/day
Collection System: Separate	Infiltration/Inflow: 0.04 mgd
Disinfection: Yes	Type: UV
Discharge Method: Continuous	

*Information from MPDES Application dated May 22, 2014, including WWTF design information dated March 2014 from Morrison Maierle, Inc.

Effluent data from the current WWTF are summarized in Table 2. These data are based on the discharge monitoring reports (DMR) submitted by the City for the 48-month period of record (POR) July 2010 through June 2014. The City also sampled the WWTF effluent once in 2010 for additional metals, phenols and cyanide. Levels of antimony, arsenic, beryllium, cadmium, chromium, nickel, selenium, thallium, phenols and cyanide were not found to be present at required reporting values (RRV). Mercury was present at 0.03 µg/L.

Table 2: Effluent Characteristics for the POR July 2010 through June 2014

Parameter	Units	Previous Permit Limits	Minimum (1)	Maximum (1)	Average (1)	Number of Samples (2)
Flow, Daily Average	mgd	-	0	0.272	0.056	48
Biochemical Oxygen Demand (BOD_5)	mg/L	30/45(3)	4	61	15	38
	lbs/day	63/94(3)	0.8	62.4	7.6	38
Total Suspended Solids (TSS)	mg/L	45/65(3)	10	76	24	38
	lbs/day	94/136(3)	1.8	81.7	10.5	38
pH(4)	s.u.	6.0 – 9.0	6.9	8.9	-	38
Escherichia coli (E. coli)[4/1 – 10/31] (5)	cfu/100ml	630/1,260	1	260	11	26
E. coli (11/1 – 3/31) (5)	cfu/100ml	3,150/6,300	1	8,000	292	12
Total Ammonia, as N	mg/L	16.4/24.0(6)	0.05	21.0	6.7	38
Kjeldahl Nitrogen, as N	mg/L	-	3.4	22.4	11.3	13
Nitrate + Nitrite, as N	mg/L	-	0.01	0.5	0.09	13
Total Nitrogen, as N (TN)	mg/L	-	3.4	22.4	11.9	13
	lbs/day(7)	-	0.6	24.5	7.4	13
Total Phosphorus, as P (TP)	mg/L	-	0.68	6.34	3.60	13
	lbs/day(7)	-	0.16	8.21	2.08	13
Temperature	°F	-	33.4	71.6	52.2	38
Oil & Grease (O&G)	mg/L	10(8)	1	6.6	3.3	13
Total Residual Chlorine (TRC)	mg/L	0.01/0.02(6)	(9)	(9)	(9)	-
Copper, Total Recoverable	µg/L	-	20	64	37	7
Iron, Total Recoverable	µg/L	-	40	720	348	7
Lead, Total Recoverable(10)	µg/L	-	1	< 10	3	7
Silver, Total Recoverable(10)	µg/L	-	< 1	< 1	< 1	7
Zinc, Total Recoverable(10)	µg/L	-	10	50	28	7

Footnotes:
1. Average values are the average of the 30-day average values reported on monthly DMRs over the POR. Maximum values are the maximum values reported for the parameter reported over the POR, except as noted. Minimum values are the minimum values for the parameter reported over the POR.
2. Number of samples is the number of monthly DMRs that reported parameter data, which in this case, is the same as the actual number of samples taken.
3. Previous permit limits are for 30-day average/7-day average.
4. Minimum & maximum values reported over the POR.
5. Geometric mean rather than average for *E. coli*.
6. 30-day average/daily max limits.
7. Not reported on DMRs – calculated from flow and concentration values submitted based on assumption that flows reported are the flows at the time of nutrient sampling.
8. Daily max limit.
9. No monitoring for TRC because chlorination was not used for effluent disinfection during the POR.
10. Used the last four samples for the average calculation for lead & silver, because the analyses used a lower reporting limit than was used on the first three samples. For zinc, two samples reported as < 10 were used at a value of 10 µg/L in average calculations because all other values were greater than 10 µg/L.

In addition to the data summarized on Table 2, DEQ sampled the WWTF effluent in September 2012 for total recoverable metals analyses. The DEQ sampling found the following levels of metals: arsenic – < 3 µg/L, cadmium – 0.17 µg/L; copper – 63 µg/L; iron – 1,660 µg/L; lead – 0.42 µg/L; silver – < 0.5 µg/L; and zinc – 50 µg/L.

The current WWTF has experienced several compliance difficulties over the POR. For DMRs submitted for July 2010 through June 2014, 17 enforcement letters were sent to the City by DEQ for violation of effluent limits, including TSS, BOD_5, percent removal of TSS and BOD_5, total ammonia nitrogen and *E. coli*; and three letters were sent for failure to properly report required monitoring. Documentation of a telephone call of explanation from the permittee was found in the permit file for the January, February and March 2013 *E. coli* violations. In addition, two letters from the permittee were found in the file explaining the reasons that two instances of improper effluent and river monitoring and reporting occurred.

The WWTF did not exceed the previous permit (permit) limitations on pH, O & G or TRC during the POR. The WWTF effluent was not monitored for TRC because the effluent was not chlorinated during the POR.

For the POR, the 95th percentile, 30-day (monthly) average BOD_5 concentration discharged from the WWTF is 52 mg/L and the 95th percentile monthly average BOD_5 load discharged is 41.3 lbs/day. Similarly, the 95th percentile, monthly average TSS concentration discharged from the WWTF is 59 mg/L and the 95th percentile monthly average TSS load discharged is 34.9 lbs/day. The WWTF is not capable of meeting the final concentration effluent limits of the previous permit for BOD_5 and TSS on a consistent basis.

The WWTF exceeded the interim winter (November 1 through March 31) average monthly permit limits on *E. coli* of the previous permit three times during the POR, in March of 2011 and in February and March of 2013. Had the final effluent *E. coli* limits [effective January 1, 2015] been in effect, the WWTF would have exceeded the winter average monthly permit limits six times (out of 12 months) and would have exceeded the summer average monthly permit limits four times (out of 26 months). The WWTF is not capable of consistently meeting effluent limits on *E. coli* without effluent disinfection.

The WWTF exceeded the interim and final average monthly permit limits on total ammonia nitrogen four times during the POR. The 95th percentile, monthly average total ammonia nitrogen concentration discharged from the WWTF is 19.1 mg/L, which exceeds the monthly average effluent limit. The WWTF is not capable of meeting the final effluent limit of the previous permit for total ammonia nitrogen.

The above discussion on the inability of the current WWTF to meet the interim and final effluent limits of the previous permit is somewhat moot because, as discussed on pages 2 and 3 of this SOB, construction has commenced on a new activated sludge WWTF with effluent disinfection, which will be capable of meeting the final effluent limits of the previous permit.

III. Technology-based Effluent Limits (TBELs)

a. Applicability to Technology-based Limitations

The Montana Board of Environmental Review (Board), in ARM 17.30.1209, adopted by reference 40 CFR 133 which defines minimum treatment requirements for secondary treatment, or the equivalent, for publicly owned treatment works (POTW). Secondary treatment is defined in terms of effluent quality as measured by BOD_5, TSS, percent removal of BOD_5 and TSS, and pH.

These requirements may be modified on a case-by-case basis for facilities that are eligible for treatment equivalent to secondary treatment (TES) or alternative state requirements (ASR) for TSS as provided for in 40 CFR 133.105. To determine if a facility is eligible for TES the facility must meet the requirements of 40 CFR 133.101(g) summarized as follows:

1) The BOD_5 and TSS effluent concentrations consistently achievable through proper operation and maintenance of the treatment works exceed the minimum effluent quality described for secondary treatment in 40 CFR 133.102,
2) The treatment works utilize a trickling filter or waste stabilization pond, and
3) The treatment works utilize biological treatment that consistently achieves a 30-day average of at least 65% removal.

The technology-based effluent limitations in the previous permit are based on the national secondary treatment standards for BOD_5 and pH and are based on TES for TSS. The previous permit effluent limitations are for effluent concentrations and loads plus 85% removal of influent BOD_5 and 65% removal of influent TSS.

Proposed TBEL-based effluent limitations are shown on Table 3. The BOD_5 limits are the national secondary treatment standards and include a requirement for 85% removal, same as in the previous permit. When the new activated sludge plant is completed, the WWTF will have no difficulty meeting the national secondary treatment standards for TSS, as well as remove at least 85% of influent TSS. Accordingly, the TSS limits for discharge from 001 will be TES with a requirement for removal of 65% of influent TSS. The TSS limits for discharge from 01A will be the national secondary treatment standards and will include a requirement for 85% removal. Mass limits for both BOD_5 and TSS are included in accordance with ARM 17.30.1345(8)(a) and are based on design flow – 0.25 mgd (current WWTF) for discharge from 001 and 0.18 mgd (new activated sludge WWTF) for discharge from 01A.

Proposed TBELs are shown on Table 3. The BOD_5 and pH effluent concentration limits are the national secondary treatment standards, including the requirement for 85% removal of BOD_5. The interim TSS limits for discharge from 001 are TES with a requirement for removal of 65% of influent TSS. The final TSS limits for discharge from 01A are the national secondary treatment standards and include a requirement for 85% removal. The mass limits for BOD_5 and TSS are calculated as discussed in the previous paragraph and reflect the treatment capabilities of the current and new WWTF.

Mass Limit Calculations:

Load (lb/day) = Design Flow (mgd) x Concentration Limit (mg/L) x 8.34 lb/gal

001 – existing lagoon WWTF

BOD_5:	30-day Ave:	Load = (0.25)(30)(8.34) = 62.55 = 63 lb/day
	7-day Ave:	Load = (0.25)(45)(8.34) = 93.82 = 94 lb/day
TSS:	30-day Ave:	Load = (0.25)(45)(8.34) = 93.82 = 94 lb/day
	7-day Ave:	Load = (0.25)(65)(8.34) = 135.52 = 136 lb/day

01A – new activated sludge WWTF

BOD_5:	30-day Ave:	Load = (0.18)(30)(8.34) = 45.04 = 45 lb/day
	7-day Ave:	Load = (0.18)(45)(8.34) = 67.55 = 68 lb/day
TSS:	30-day Ave:	Load = (0.18)(30)(8.34) = 45.04 = 45 lb/day
	7-day Ave:	Load = (0.18)(45)(8.34) = 67.55 = 68 lb/day

Table 3: Technology-based Effluent Limits

Parameter	Units	30-Day Average	7-Day Average	Outfall	Rationale
BOD_5	mg/L	30	45	001	40 CFR 133.102(a)
	lb/day	63	94		
	% removal	85%	-		
TSS	mg/L	45	65		40 CFR 133.105(b)
	lb/day	94	136		
	% removal	65%	-		
pH	s.u.	6.0-9.0 (instantaneous)			40 CFR 133.102(c)
BOD_5	mg/L	30	45	01A	40 CFR 133.102(a)
	lb/day	45	68		
	% removal	85%	-		
TSS	mg/L	30	45		40 CFR 133.102(b)
	lb/day	45	68		
	% removal	85%	-		
pH	s.u.	6.0-9.0 (instantaneous)			40 CFR 133.102(c)

b. Nondegradation Allocated Loads

Nondegradation allocated loads for the WWTF were determined under a previous permitting action and documented in a SOB dated November 29, 1994. The SOBs for the permits renewed (a) July 1, 2001 (administratively extended December 1, 2005) and (b) January 12, 2010 (modified January 30, 2013) referenced the nondegradation loads calculated in 1994.

The proposed BOD_5 and TSS load limits do not exceed the nondegradation allocated loads determined in 1994. As discussed earlier, the final BOD_5 and TSS load limits reflect the 0.18 mgd design flow of the new activated sludge WWTF, which is less than the 0.25 mgd design flow of the existing lagoon system. In fact, the final effluent load limits for BOD_5 and TSS for discharge from 01A are 29% less and 78% less, respectively, than the nondegradation allocated loads established in 1994 for discharge from 001. Further, the required percentage removal of influent TSS is increased from 65% for discharge from 001 to 85% for discharge from 01A. In accordance with ARM 17.30.702(18), the Boulder WWTF discharge is not a new or increased source for purposes of nondegradation.

IV. Water Quality-based Effluent Limitations (WQBELs)

a. Scope and Authority

Permits are required to include water quality-based effluent limits (WQBELs) when technology-based effluent limits are not adequate to prevent excursions of state water quality standards (40CFR 122.44 and ARM 17.30.1344). ARM 17.30.637(2) states that no wastes may be discharged that can reasonably be expected to violate any state water quality standards. Montana water quality standards (ARM 17.30.601 *et seq.*) define both water use classifications for all state waters and numeric and narrative standards that protect those designated uses.

b. Receiving Water

The WWTF discharges treated effluent to the Boulder River. The reach of the Boulder River that receives the WWTF discharge is classified as B-1 according to Montana Water Use Classifications [ARM 17.30.610(1)(a)]. Waters classified B-1 are to be maintained suitable for drinking, culinary, and food processing purposes, after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply [ARM 17.30.623(1)].

The Boulder River where it receives the discharge from the WWTF is located within the Boulder River watershed identified as U. S. Geological Survey (USGS) Hydrological Unit Code (HUC) 10020006 and stream segment MT41E001_022. This stream segment is listed as impaired on the 1996 303(d) List but given a low priority for development of a TMDL. Probable impaired uses are aquatic life support and cold water fishery-trout, drinking water supply, recreation, and swimmable. The probable causes of impairment were listed as flow alteration, nutrients, metals, other habitat alterations, siltation, and thermal modifications. The probable sources were agriculture, irrigated crop production, mill tailings, resource extraction, and subsurface mining. The 2014 303(d) listing includes “not supporting” for drinking water and aquatic life. Probable

causes of impairment are listed as alteration in stream-side or littoral vegetative covers, arsenic, cadmium, copper, iron, lead, zinc, low flow alterations, sedimentation/siltation and water temperature. Probable sources of impairment are listed as habitat modification, impacts from abandoned mines, loss of riparian habitat, acid mine drainage, contaminated sediments, impacts from hydrostructure flow regulation/modification, irrigated crop production, and grazing in riparian or shoreline zones.

DEQ has completed total maximum daily loads (TMDLs) for the Boulder River. Boulder-Elkhorn Metals TMDLs and Framework Water Quality Improvement Plan was completed in December 2012 and Sediment, Nutrients, and Temperature TMDLs and Water Quality Improvement Plans for the Boulder-Elkhorn Planning Area was completed in September 2013.

Table 4 contains ambient water quality data collected by the City on the Boulder River immediately upstream from the WWTF and nutrient data collected by or on behalf of DEQ, also upstream of the WWTF.

Table 4: Boulder River Ambient Water Quality Data[(1)(2)]

Parameter	Units	Minimum	Maximum	Average	75th Percentile	Number of Samples
pH	s.u.	6.3	8.2	6.9	7.3	84
Hardness, as $CaCO_3$	mg/L	28	71	50	37[(3)]	6
Iron, TR[(4)]	µg/L	120	640	303	572	6
Lead, TR[(4)]	µg/L	< 1	10	< 8.5	< 10	6
Copper, TR[(4)]	µg/L	8	34	< 14	< 16	6
Zinc, TR[(4)]	µg/L	40	160	85	108	6
Silver, TR[(4)]	µg/L	< 1	< 5	< 4	< 5	6
Total Ammonia, as N	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	29
TN	µg/L	160	170	165	--	2
TP	µg/L	10	50	23	--	3
Temperature	°C	0	19.3	6.5	11.8	84

Footnotes:
1. Ambient water quality data from water quality monitoring conducted by the City from September 2009 through June 2014 (pH, temperature and ammonia). Metals and hardness samples taken from 2010 to 2012. For ammonia, only samples taken from October 2011 through June 2014 were considered because the reporting level was reduced to 0.05 mg/L and all samples showed less than the reporting level.
2. Insufficient data exists to calculate a meaningful 75th percentile for TN and TP.
3. 25th percentile hardness.
4. TR is total recoverable. All values reported at less than reporting levels for silver. Reporting levels for lead and silver lowered to 1µg/L for the last two sets of samples taken in 2012.

A USGS gaging station (06033000) is located on the Boulder River, approximately two miles downstream of the WWTF. This gaging station has over 58 years of record and calculates the 7-day, 10-year low flow (7Q10) at 6.2 cfs (4.0 mgd). The seasonal (July-October) 14-day, 5-year low flow (14Q5) at this gaging station is reported at 9.2 cfs (5.9 mgd). The 7Q10 and 14Q5 were both obtained from the USGS publication Statistical Summaries of Streamflow in Montana and Adjacent Areas, Water Years 1900 through 2002, 2004.

The Montana Department of Fish, Wildlife and Parks (FWP) through the Montana Fisheries Information System (MFISH) lists rainbow trout as a salmonid being abundant in the Boulder River in the vicinity of the WWTF, with brown trout and mountain whitefish as salmonids considered common. Brook trout are a salmonid considered rare in the same reach of the Boulder River.

No non-salmonid species are listed by MFISH as abundant or common in the Boulder River in the vicinity of the WWTF. Non-salmonids considered rare in this reach of the Boulder River are longnose dace, longnose sucker, mottled sculpin and white sucker.

Based on "Spawning Times of Montana Fishes," Don Skaar, FWP, March 6, 2001, rainbow trout may be present in early life stages in the Boulder River in the vicinity of the WWTF from March through mid-August, brown trout are expected from mid-September through April, and brook trout are expected from September through mid-May. Though rare, non-salmonid fishes are likely present in the vicinity of the WWTF in early life stages from March through August, depending on the species. Accordingly, salmonid and non-salmonid fishes are assumed to be present in early life stages in the receiving water year-round.

c. Water Quality Standards

Discharges to surface waters classified B-1 are subject to the specific water quality standards of ARM 17.30.623, CIRCULAR DEQ-7 (DEQ-7), and the general provisions of ARM 17.30.635 through 637. Discharges are also subject to ARM 17.30 Subchapter 5 (Mixing Zones) and Subchapter 7 (Nondegradation of Water Quality).

d. Mixing Zone

A mixing zone is an area where effluent mixes with the receiving water and certain water quality standards may be exceeded [ARM 17.30.502(6)]. A mixing zone must be of the smallest practicable size, have a minimum effect on water uses, and have definable boundaries [MCA 75-5-301(4)]. No mixing zone will be granted that will impair beneficial uses [ARM 17.30.506(1)]. Acute standards for any parameter may not be exceeded in any portion of the mixing zone unless DEQ specifically finds that allowing minimal initial dilution will not threaten or impair existing beneficial uses [ARM 17.30.507(1)(b)]. Beneficial uses relative to growth and propagation of salmonid fishes and associated aquatic life are considered to be protected if the discharge does not block passage of aquatic organisms or cause acute lethality to aquatic organisms passing through the mixing zone as addressed in ARM 17.30.602(16).

The discharge must comply with the general prohibitions of ARM 17.30.637(1) which requires that state waters, including mixing zones, must be free from substances which will:

(a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;
(b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;
(c) produce odors, colors, or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;
(d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; and
(e) create conditions which produce undesirable aquatic life.

ARM 17.30.505(1) provides that DEQ will determine the applicability of a mixing zone and, if applicable, its size, configuration, and location. Mixing zones are considered on a case-by-case basis. DEQ may decide to not grant a mixing zone or may decide to grant one of the four types of mixing zones, i.e. nearly-instantaneous, standard, alternative or source-specific mixing zone. Mixing zones are granted on a parameter-by-parameter basis only and are not granted for TBELs based on national secondary treatment standards, effluent guidelines or other technology-based standards.

In the previous permit, the permittee was allowed (1) a chronic mixing zone that extended 100 feet downstream and 27 feet in width from the point of discharge for total ammonia-N and TRC; and (2) an acute mixing zone that extended 10 feet downstream and 5 feet in width for total ammonia-N and TRC. All effluent limitations were applied at the end of the discharge pipe.

Consideration will be given for a mixing zone on a parameter-by-parameter basis. A standard mixing zone does not allow for use of dilution to comply with acute water quality standards. In addition, a standard mixing zone can only be used if the maximum length of the mixing zone is calculated in accordance with ARM 17.30.516(4), which requires a mixing zone study and site specific information at the discharge site with a 7Q10 stream flow that is not available to DEQ, absent a study. For the above reasons a standard mixing zone will not be considered.

The nearly-instantaneous mixing zone is not appropriate because of lack of completed mixing in the receiving water at the point of discharge. In addition, the nearly-instantaneous mixing zone does not allow for use of dilution to comply with acute water quality standards.

A source-specific mixing zone is not practical because of the lack of the required mixing zone study, which must be provided to DEQ by the applicant and be based on use of an approved water quality model.

Typically, the most appropriate mixing zone type for minor POTWs, and the type that will be considered for this permit, is the alternative mixing zone. The alternative mixing zone [ARM 17.30.515(1)(d)] was created for use with minor POTWs, and allows the use of 10% of the 7Q10 for dilution of chronic parameters and use of 1% of the 7Q10 for dilution of acute parameters. For human health parameters, 25% of the 7Q10 is typically used. Boundaries for an alternative

mixing zone are proposed at 100 feet in length and one-half the estimated low flow receiving stream width (stream width) for chronic and human health parameters and 10 feet in length and one-tenth the stream width for acute parameters.

e. Basis for WQBELs (Reasonable Potential and Calculations)

Permits are required to include WQBELs when technology-based effluent limits are not adequate to protect water quality standards and no wastes may be discharged that can reasonably be expected to violate any standard. The need for WQBELs is determined based on reasonable potential (RP) calculations for certain pollutants to determine if numeric or narrative water quality standards may be exceeded. DEQ uses a mass balance equation (Equation 1) to determine reasonable potential based on the *EPA Technical Support Document for Water Quality-based Toxics Control* (TSD)(EPA/505/2-90-001) and DEQ-7.

$$C_{RP} = \frac{C_E Q_E + C_S Q_S}{Q_E + Q_S} \qquad \textit{(Equation 1)}$$

Where:

C_{RP} = receiving water concentration (RWC) after mixing, mg/L
C_E = effluent concentration, mg/L
C_S = RWC concentration upstream of discharge, mg/L
Q_S = applicable receiving water flow, mgd
Q_E = facility design flow rate, mgd

Pollutants typically present in treated effluent from municipal wastewater treatment facilities that may cause or contribute to exceedences of water quality standards include conventional pollutants such as biological material (measured by BOD_5), TSS, oil & grease, *E. coli* bacteria and pH; non-conventional pollutants such as total residual chlorine (TRC), total ammonia-N, nitrate/nitrite, TN and TP; and toxic pollutants such as volatile organics and metals.

1. Conventional Pollutants

TSS, BOD_5, and pH – The new WWTF will provide a significant reduction in biological material and solids through secondary treatment as addressed in Section III. No additional WQBELs will be necessary for these parameters.

Oil and Grease (O & G) – For O & G, the previous permit had a daily maximum effluent limit of 10 mg/L and quarterly effluent monitoring. Effluent monitoring during the POR found a maximum level of O & G of 6.6 mg/L in one sample out of 13 total samples taken during the POR. Based on a calculated coefficient of variation (CV) of 0.53, the TSD Table 3.2 multiplier for 13 samples is 1.53. Application of the TSD multiplier results in a TSD calculated maximum effluent value for O & G of 10.1 mg/L. Therefore, based on effluent monitoring during the POR, RP may exist for O & G in the discharge from the WWTF to exceed levels that will produce a sheen, i.e. 10 mg/L. Accordingly, effluent limits and monthly monitoring for O & G will be required in the renewed permit.

Escherichia coli (E. coli) Bacteria – The previous permit had final effluent limits, effective January 1, 2015, for *E. coli* bacteria that are the water quality standards for the Boulder River, applied at the end-of-pipe at the point of discharge.

The water quality standards for the Boulder River for *E. coli* are:

- April 1 through October 31, of each year, the geometric mean number of *E. coli* may not exceed 126 colony forming units (cfu) per 100 mL and 10% of the total samples may not exceed 252 cfu per 100 mL during any 30-day period [ARM 17.30.623(2)(a)(i)]; and

- November 1 through March 31, of each year, the geometric mean number of *E. coli* may not exceed 630 cfu per 100 mL and 10% of the samples may not exceed 1,260 cfu per 100 mL during any 30-day period [ARM 17.30.623(2)(a)(ii)].

The final effluent limits on *E. coli* bacteria of the previous permit will be retained in the renewed permit. The monitoring frequency for *E. coli* bacteria will be maintained at once per month until the new WWTF, with UV effluent disinfection, is operational and discharging through Outfall 01A, when the frequency of sampling will be increased to three samples per week.

2. Non-conventional Pollutants

Total Residual Chlorine (TRC) – The previous permit included effluent limits for TRC, applicable if chlorination was used for disinfection of the effluent. Since UV effluent disinfection will be installed with the new WWTF in 2015, chlorination will not be used and the TRC limits of the previous permit will not be needed in this permit.

Total Ammonia-N – The previous permit had total ammonia-N limits of 16.4 mg/L (average monthly limit) and 24.0 mg/L (maximum daily limit). Total ammonia-N limits are developed based on standards that account for a combination of pH and temperature of the receiving stream, the presence or absence of salmonid fishes (trout, whitefish and salmon), and the presence or absence of fish in early life stages. Water quality standards for total ammonia-N and the resulting effluent limits are determined on an annual basis.

In the 2010 renewal of the permit for the WWTF, the total ammonia-N water quality standards for the Boulder River in the vicinity of the WWTF calculated to be 22.0 mg/L (acute) and 5.67 mg/L (chronic), based on 38 months of monitoring data. Review of the latest 46 months of Boulder River monitoring data shows a higher 75th percentile pH, which would result in lower acute and chronic water quality standards for total ammonia-N. Accordingly, DEQ has determined it appropriate to use all of the historical Boulder River monitoring data (84 months) obtained from April 2006 through June 2014 to assure that accurate water quality standards for total ammonia-N are established for the Boulder River in the vicinity of the WWTF. The standards were developed using the water quality data from the Boulder River and summarized on Table 4. The 75th percentile pH calculates to be 7.3 s.u. and the 75th percentile temperature calculates to be 11.8 °C. All of the total ammonia-N sampling in the Boulder River conducted by the City over the POR showed "not detected at reporting level". Commencing with the October 2011 sampling, the reporting level was reduced from 0.1 mg/L to 0.05 mg/L, and

subsequent samples still reported levels less than the reporting level. Based on the monitoring data, the background total ammonia-N level in the Boulder River will be estimated conservatively at 0.05 mg/L, the same level used in the November 2009 SOB for the purposes of calculation of RP for the previous permit.

For an alternative mixing zone, applicable to minor POTW discharges, 10% of the 7Q10 may be used for purposes of calculating RP and effluent limits for chronic toxicity and 1% of the 7Q10 is allowed for dilution for acute toxicity for discharges to rivers and streams. The TSD is used for determining RP and for developing effluent limits. Table 5 contains the applicable water quality standards for total ammonia-N calculated for the Boulder River in the vicinity of the Boulder WWTF.

Table 5: Applicable Water Quality Standards for Total Ammonia (NH_3-N plus NH_4-N)

Condition	Period	Salmonids Present	Early Life Stages Present	Ambient Condition[1]		Water Quality Standard[2] (mg/L)
				pH (s.u.)	Temperature (°C)	
Acute	Annual	Yes	NA	7.3	NA	17.5
Chronic	Annual	NA	Yes	7.3	11.8	5.08

NA = Not Applicable

Footnotes:

1. Based on 75th percentile of pH & temperature data obtained by the permittee from April 2006 – June 2014 (84 mo.).
2. Based on DEQ-7 (October 2012).

For the 48-month POR, the maximum effluent concentration of total ammonia-N reported from the Boulder WWTF was 21.0 mg/L. Based on a calculated coefficient of variation (CV) of 0.85, the TSD Table 3-2 multiplier is 1.5. Applying the multiplier to the maximum reported value, the calculated maximum effluent total ammonia-N concentration is 31.5 mg/L. Equation 1 was used to determine RP, using a (TSD calculated maximum) effluent total ammonia-N level of 31.5 mg/L; receiving water flows of 0.40 mgd (10% of 7Q10) for chronic and 0.04 mgd (1% of the 7Q10) for acute; design WWTF flow (0.25 mgd); and an estimated background level (estimated 75th percentile) of total ammonia-N in the Boulder River of 0.05 mg/L.

The calculated RP values are 12.2 mg/L for chronic and 27.2 mg/L for acute, both of which exceed water quality standards. Therefore, RP exists to exceed both the chronic and acute water quality standards for total ammonia-N in the Boulder River. RP calculations are found in Appendix A.

For an alternative mixing zone, with a dilution flow of 0.40 mgd, the calculated monthly average chronic total ammonia-N limit is 10.1 mg/L. With a dilution flow of 0.04 mgd, the calculated daily maximum acute total ammonia-N limit is 20.2 mg/L. Both limits apply at end-of-pipe. Effluent limit calculations are found in Appendix A.

The effluent limits for total ammonia-N are slightly more stringent than calculated for the present permit. However, they are appropriate because they are based on significantly more instream water quality data for temperature and pH; 84 months of data used to calculate these limits (including the data used for the previous permit) versus 37 months of data used to calculate the previous permit limits.

The total ammonia-N limits calculated in this SOB will be included in this permit. From the point of discharge, the dimensions of the alternative mixing zone is 100 feet downstream and 0 feet upstream, with a width of 27 feet for the chronic water quality standards; and 10 feet downstream and 0 feet upstream, with a width of 5 feet for the acute water quality standards. Mixing zone widths are based on an estimated low flow stream width of the Boulder River at the point of the Boulder WWTF discharge of 54 feet.

Nitrate plus Nitrite Nitrogen (NO_3/NO_2) – The human health water quality standard for NO_3/NO_2 in waters to be maintained suitable for drinking is 10 mg/L.

Table 2 shows that for the POR, effluent NO_3/NO_2 levels are quite low, averaging 0.09 mg/L, with a maximum level of 0.5 mg/L reported. Based on a calculated CV of 1.6, the TSD Table 3-2 multiplier is 2.5. Applying the multiplier to the maximum reported value, the calculated maximum effluent NO_3/NO_2 concentration is 1.2 mg/L. With a TSD maximum NO_3/NO_2 level of 1.2 mg/L, there is no need for calculations to determine if RP exists. RP does not exist with NO_3/NO_2 levels this low. It should be noted however, that the level of nitrification provided in the new activated sludge wastewater treatment plant may result in relatively high levels of NO_3/NO_2 in the effluent. The permittee will need to balance plant operation to avoid discharging high levels NO_3/NO_2 while reducing effluent levels of total ammonia-N.

No effluent limits on NO_3/NO_2 will be applied to the discharge from the Boulder WWTF during this renewal cycle. However, monitoring requirements for NO_3/NO_2 will be continued in the renewed permit.

Nutrients (Total Nitrogen as N and Total Phosphorus as P) – Nutrients were identified as a probable cause of impairment on the 1996 303(d) List. However, as discussed previously, Montana stream segment MT41E001_022 is not listed as impaired for nutrients on the 2014 303(d) List and, accordingly, TMDLs will no longer be developed for nutrients.

Numeric water quality standards for TN and TP have been adopted in DEQ Circular DEQ-12A (DEQ-12A) for the Boulder River, which is in the Level III Middle Rockies Ecoregion. The numeric water quality standards for TN and TP are 300 µg/L and 30 µg/L, respectively, both effective from July 1 to September 30. Critical stream-flow for application of the standards and for determining RP is the seasonal (July-October) 14Q5 low flow.

Boulder was required to conduct quarterly sampling for TN and TP, which resulted in samples being taken in the months of June and September. For the June through September months of the POR, the maximum effluent concentration of TN reported from the Boulder WWTF was 14.8 mg/L. Based on a calculated CV of 0.4, the TSD Table 3-2 multiplier is 1.6. Applying the multiplier to the maximum reported value, the calculated maximum June through September

effluent TN concentration is 23.7 mg/L. Equation 1 was used to determine RP, using a (TSD calculated maximum) effluent TN level of 23.7 mg/L; receiving water flow of 5.9 mgd (14Q5) ; design WWTF flow (0.18 mgd); and a background level of TN in the Boulder River of 165 µg/L (see Table 4).

The calculated RP value is 860 µg/L, which exceeds water quality standards. Therefore, RP does exist to exceed the numeric water quality standards for TN in the Boulder River. Effluent limits on TN will be applied to the discharge from the Boulder WWTF during this renewal cycle.

At the seasonal 14Q5 flow in the Boulder River, the calculated average monthly (AML) TN concentration limit is 4.8 mg/L and the AML load limit is 7.2 lbs/day. The load limit is calculated based on the design capacity of the new activated sludge WWTF. RP and effluent limit calculations are found in Appendix B.

The activated sludge WWTF presently under construction will likely not be able to meet the final effluent limits for TN and the City has chosen to pursue a general variance as allowed in DEQ Circular DEQ-12B (DEQ-12B). The City's request for a general variance from the total nitrogen water quality standard established for the Boulder River in DEQ-12A is tentatively approved. Accordingly, the effective date for compliance with the TN effluent limits calculated above will be August 2034.

In accordance with DEQ-12B, a general variance interim effluent limit for TN will be developed for the WWTF, based on maintaining the current level of performance of the existing WWTF, a lagoon system. The interim limit for TN calculates to be an AML of 45.9 lbs/day and will apply through the term of the renewed permit. In the next permit cycle, the interim limit for TN will be recalculated based on the CV of TN from the new activated sludge WWTF. Interim permit limit calculations for TN are found in Appendix D. Monitoring and reporting requirements for TN will be continued in the renewed permit.

For the June through September months (8 total) of the POR, the maximum effluent concentration of TP reported from the Boulder WWTF was 4.87 mg/L. Based on a calculated CV of 0.5, the TSD Table 3-2 multiplier is 1.7. Applying the multiplier to the maximum reported value, the calculated maximum June through September effluent TP concentration is 8.28 mg/L. Equation 1 was used to determine RP, using a (TSD calculated maximum) effluent TP level of 8.28 mg/L; receiving water flow of 5.9 mgd (14Q5); design WWTF flow (0.18 mgd); and a background level of TP in the Boulder River of 23 µg/L (see Table 4).

The calculated RP value is 268 µg/L, which exceeds water quality standards. Therefore, RP does exist to exceed the numeric water quality standards for TP in the Boulder River. Effluent limits on TP will be applied to the discharge from the Boulder WWTF during this renewal cycle.

At the seasonal 14Q5 flow in the Boulder River, the calculated average monthly (AML) TP concentration limit is 0.26 mg/L and the AML load limit is 0.39 lbs/day. The load limit is calculated based on the design capacity of the new activated sludge WWTF. RP and effluent limit calculations are found in Appendix C.

The activated sludge WWTF presently under construction will likely not be able to meet the final effluent limits for TP and the City has chosen to pursue a general variance as allowed in DEQ-12B. The City's request for a general variance from the total phosphorus water quality standard established for the Boulder River in DEQ-12A is tentatively approved. Accordingly, the effective date for compliance with the TP effluent limits calculated above will be August 2034.

In accordance with DEQ-12B, a general variance interim effluent limit for TP will be developed for the WWTF, based on maintaining the current level of performance of the existing WWTF, a lagoon system. The interim limit for TP calculates to be an AML of 9.2 lbs/day and will apply through the term of the renewed permit. In the next permit cycle, the interim limit for TP will be recalculated based on the CV of TP from the new activated sludge WWTF. Interim permit limit calculations for TP are found in Appendix D. Monitoring and reporting requirements for TP will be continued in the renewed permit.

Dissolved Oxygen (DO) – Freshwater aquatic life standards are characterized by the fishery (cold- or warm-water) and by the presence or absence of fish in early life stages. Standards are further defined based on a time frame and required DO levels. B-1 waterbody classification states the receiving waters are to be maintained for growth and propagation of salmonid fishes and associated aquatic life. DO standards for B-1 waters are given in Table 6.

Table 6: B-1 Water Classification Dissolved Oxygen Standards

Dissolved Oxygen	30-Day Mean (mg/L)	7-Day Mean (mg/L)	7-Day Mean Minimum [1] (mg/L)	1-Day Minimum [1] (mg/L)
Early Life Stages [2]	NA	6.5	NA	5.0
Other Life Stages	6.5	NA	5.0	4.0

Footnotes:
"NA" means "Not Applicable".
1. All minima should be considered as instantaneous concentrations to be achieved at all times.
2. Includes all embryonic and larval stages and all juvenile forms of fish to 30-days following hatching.

Although the Boulder River is listed as impaired for aquatic life, low DO levels are not mentioned as a probable cause. Properly designed and operated secondary treatment facilities typically remove sufficient biological material from the raw waste stream to prevent creation of a DO depletion problem in the receiving water. The new activated sludge WWTF presently under construction will produce an effluent with a very low level of biological material and no adverse impact on instream DO levels is anticipated.

Sediment & Temperature – As discussed in Section IV(b) of this SOB, the 2014 303(d) List identifies sedimentation/siltation and water temperature as probable causes of impairment for non-support of aquatic life. The Sediment, Nutrients, and Temperature TMDLs and Water Quality Improvement Plans for the Boulder-Elkhorn Planning Area [Sed/N/Temp TMDLs]

established sediment and temperature TMDLs for the Boulder River from the City to Cottonwood Creek. Accordingly, Sed/Temp TMDLs assigned the Boulder WWTF wasteload allocations (WLA) for each sediment and temperature.

Table 5-44 of the Sed/N/Temp TMDLs established a total allowable sediment load of 22.4 tons/year from the Boulder WWTF. This WLA is met by the TBEL load limit on TSS of 45 lbs/day (30-day average). The maximum allowable discharge of TSS from the Boulder WWTF, at facility design flow, is 8.2 tons/year. Additional limits beyond the proposed TSS load limits are not needed to meet the sediment WLA for the Boulder WWTF.

Table 6-2 of the Sed/N/Temp TMDLs established a TMDL temperature allocation for the Boulder WWTF. The temperature allocation for the Boulder WWTF is:

(a) Discharge may not raise the water temperature by more than 1º F when river temperatures are at or below 66º F.
(b) Discharge may not raise the water temperature to more than 67º F when river temperatures at the WWTF discharge are within 66.5º F - 66º F.
(c) Discharge may not raise the temperature more than 0.5º F when river temperatures at the WWTF discharge exceed 67º F.

Section 6.6.2.1 of the Sed/N/Temp TMDLs states, in pertinent part: *"…Note that the wasteload allocation for the City of Boulder WWTP is the allowable increase above the naturally occurring conditions per the temperature standard…**Based on the analysis performed in Section 6.5.2, the Boulder WWTP currently satisfies the WLA**…"* (emphasis added)

Section 6.5.2 of the Sed/N/Temp TMDLs states, in pertinent part: *"…To evaluate the effects of temperature, an instantaneous thermal load (in kilocalories) can be calculated for the streamflow and the WWTP discharge flows per Equation 6-1 below. Note, this loading equates to the thermal load applicable to the water from the freezing point at 32º F. The effects of the WWTP discharge can then be calculated by mixing the discharge water with the flow of the Boulder River under differing conditions.*

*Equation 6-1: Instantaneous Thermal Load (ITL) = (Δ-32)*Q*(15.6)*
Where:
Δ = water temperature (F)
Q = streamflow or WWTP discharge
15.6 = conversion factor

Records from the DMR data…indicate…the effluent flow from the WWTP was 0.42 cfs at a temperature of 70.0º F. The instantaneous thermal load entering the stream from the WWTP on this date was 250 kilocalories (kcal) per second (s)…Boulder River flows can often be as low as 13 cfs during low-flow conditions based on the 25th percentile results for the USGS gaging station above…Boulder. This information can be used as a typical worst-case scenario to evaluate the WWTP discharge effects when the river temperature is 66.5º F and flowing at 13 cfs…it would be good to know the maximum allowable effluent temperature under the above river conditions, a 0.42 cfs WWTP discharge, and a river temperature of 67º F after mixing.

Plugging these values into Equation 6.1 produces a thermal load of 7,327 kcal in the river, of which 6,997 kcal is the upstream thermal load before mixing. This equates to an allowable thermal increase of 330 kcal, which further equates to ***an allowable maximum WWTP discharge temperature of 82.4º F****…"* (emphasis added)

Since the Boulder WWTF effluent flow of 0.42 cfs used in the above calculations is greater than the design flows of the existing WWTF of 0.25 mgd (0.39 cfs) and the new activated sludge WWTF of 0.18 mgd (0.28 cfs), establishing a maximum effluent temperature limit of 82.4º F is conservative and will assure compliance with the temperature allocation for the Boulder WWTF.

3. Toxic Pollutants

Metals – Effluent monitoring for total recoverable copper, iron, lead, silver and zinc was required in the previous permit, on a twice per year basis. In addition, monitoring for total recoverable antimony, arsenic, beryllium, cadmium, chromium, mercury, nickel, selenium and thallium was required once in 2010. No effluent data for metals were required to be submitted with NPDES Form 2A Application for permit renewal because the WWTP design flow is less than 1 mgd.

As discussed in Section IV(b) of this SOB, the 2014 303(d) List identifies arsenic, cadmium, copper, iron, lead and zinc as probable causes of impairment for non-support of aquatic life. The Boulder-Elkhorn Metals TMDLs and Framework Water Quality Improvement Plan [Metals TMDLs] established arsenic, cadmium, copper, iron, lead, and zinc TMDLs for the Boulder River from the City to Cottonwood Creek. Accordingly, Metals TMDLs assigned the Boulder WWTF a WLA for each of the listed metals and allowed 20 years to achieve the WLAs. The WLAs are examples based on the WWTF discharge flow multiplied times the TMDL target concentration. Narrative in the Metals TMDLs indicates that the WLAs may be modified prior to the end of the 20 year period should a comprehensive historic mine remediation plan be developed and implemented to provide upstream assimilative capacity within the Boulder River.

Table 5-24 of the Metals TMDLs established the following target concentrations for the listed metals at high and low stream flows:

Metal	Target Concentration in Boulder River	
	High Flow, µg/L	Low Flow, µg/L
Cadmium	0.11*	0.17**
Copper	3.43*	5.42**
Lead	0.72*	1.42**
Zinc	44.42*	69.97**
Arsenic	10	10
Iron	1,000	1,000

*At a stream hardness of 31 mg/L.
**At a stream hardness of 53 mg/L.

Table 5-40 of the Metals TMDLs provided these example WLAs for the Boulder WWTF for the listed metals at high and low stream flows:

Metal	WLA	
	High Flow, lbs/day	Low Flow, lbs/day
Cadmium	0.0001	0.0001
Copper	0.0034	0.002
Lead	0.0007	0.0005
Zinc	0.044	0.024
Arsenic	0.011	0.0038
Iron	1	0.378

Section 5.7.15 of the Metals TMDLs states, in pertinent part : "…*The wasteload allocation examples to the Boulder WWTP in Table 5-40 only represent example WLAs under assumed discharge flow conditions...*" Section 5.7.15 further states, in pertinent part: "…*For the phased metals WLA implementation, the City of Boulder has 20 years to achieve the WLA at levels consistent with discharge flow times the TMDL target concentration…During that time period, the WWTP operators should continue to semi-annually monitor arsenic, cadmium, copper, iron, lead, and zinc concentrations and flow in the outfall with a focus that ensures monitoring also occurs during annual high flow conditions. Also, detection limits need to be low enough to adequately compare results to the TMDL targets within this document*…"

Since the WLAs will be phased in over 20 years (by 2032), this renewed permit will not contain the WLAs as effluent limits. However, monitoring of the WWTF effluent for the listed metals will be required twice per year, with laboratory reporting levels equal to the RRVs of DEQ-7 and with one of the sample sets required to be taken during high flow (May 15 to June 15) and the other sample sets required to be taken during low flow (September or October). Upstream Boulder River monitoring for metals will not be required. The prescribed effluent monitoring for metals meets the intent of the TMDLs.

Cyanide & Phenol – The previous permit required effluent monitoring for cyanide and phenols in the year 2010. The City complied with this requirement and the effluent samples did not detect the presence of cyanide or phenols at RRVs. No limits will be required for cyanide or phenols in the renewed permit, nor will testing for cyanide or phenols be required.

Whole Effluent Toxicity (WET) Testing – ARM 17.30.637(1)(d) requires that state water be free from substances attributable to municipal waste that create conditions which are harmful or toxic to human, animal, plant or aquatic life, except DEQ may allow limited toxicity in a mixing zone provided that there is no acute lethality to organisms. The previous permit did not require WET testing. The Boulder WWTF is a small discharger of less than 0.25 mgd with no reported industrial contributions. No WET testing will be required with this permit cycle.

V. Effluent Limitations

Discharge from the lagoon system through Outfall 001 will occur until construction of the new activated sludge WWTF is complete and the new facility commences discharge through Outfall 01A. Discharges through Outfalls 001 and 01A are not allowed to occur simultaneously and no discharge through Outfall 001 shall occur after discharge through Outfall 01A is commenced. The Outfall 001 Effluent Limits on Table 7 apply to the discharge from the lagoon system through Outfall 001 and apply until discharge from the new activated sludge WWTF commences through Outfall 01A. The Outfall 01A Effluent Limits on Table 8 apply to the discharge from the new activated sludge WWTF through Outfall 01A and remain in effect for the term of the permit.

Effective on the permit issuance date, the quality of effluent discharged by the facility through Outfalls 001 or 01A shall, as a minimum, meet the limitations as set forth below:

Table 7: Outfall 001 Effluent Limits

Parameter	Units	Average Monthly Limit [1]	Average Weekly Limit[1]	Maximum Daily Limit
Biochemical Oxygen Demand (BOD_5)	mg/L	30	45	--
	lbs/day	63	94	--
BOD_5, Removal	%	85	--	--
Total Suspended Solids (TSS)	mg/L	45	65	--
	lbs/day	94	136	--
TSS, Removal	%	65	--	--
E. coli[2]	cfu/100ml	126	252	--
E. coli[3]	cfu/100ml	630	1,260	--
Total Ammonia, as N	mg/L	10.1	--	20.2
Temperature	ºF	--	--	82.4
TN, as N[4]	lbs/day	45.9	--	--
TP, as P[4]	lbs/day	9.2	--	--
Oil and Grease	mg/L	--	--	10
pH	s.u.	6.0 – 9.0 (instantaneous)		

Footnotes:
1. See Definition section at end of permit for explanation of terms.
2. This limitation applies from April 1 through October 31.
3. This limitation applies from November 1 through March 31.
4. **General Variance Limitation.** This limitation applies from July 1 through September 30.

Table 8: Outfall 01A Effluent Limits				
Parameter	Units	Average Monthly Limit (1)	Average Weekly Limit(1)	Maximum Daily Limit
Biochemical Oxygen Demand (BOD_5)	mg/L	30	45	--
	lbs/day	45	68	--
BOD_5, Removal	%	85	--	--
Total Suspended Solids (TSS)	mg/L	30	45	--
	lbs/day	45	68	--
TSS, Removal	%	85	--	--
E. coli(2)	cfu/100ml	126	252	--
E. coli(3)	cfu/100ml	630	1,260	--
Total Ammonia, as N	mg/L	10.1	--	20.2
Temperature	°F	--	--	82.4
TN, as N(4)	lbs/day	45.9	--	--
TP, as P(4)	lbs/day	9.2	--	--
Oil and Grease	mg/L	--	--	10
pH	s.u.	6.0 – 9.0 (instantaneous)		

Footnotes:
1. See Definition section at end of permit for explanation of terms.
2. This limitation applies from April 1 through October 31.
3. This limitation applies from November 1 through March.
4. **General Variance Limitation.** This limitation applies from July 1 through September 30.

Outfall 01A Final Nutrient Limits

The following effluent limits take effect upon expiration of the general variance in August 2034. These limits shall replace the TN and TP limits in the previous tables.

Parameter	Units	Average Monthly Limit (1)	Average Weekly Limit	Maximum Daily Limit
TN, as N	mg/L	4.8	--	--
	lbs/day	7.2	--	--
TP, as P	mg/L	0.26	--	--
	lbs/day	0.39	--	--

Footnotes:
1. This limitation applies from July 1 through September 30.

VI. Self-Monitoring & Other Requirements

a. Self-Monitoring

Outfall 001: Effluent flow measurements are to be taken at the outlet V-notch weir and effluent samples are to be taken immediately after the weir.

Outfall 01A: Effluent flow measurements are to be taken at the effluent parshall flume and effluent samples are to be taken at the UV system outlet.

Influent samples for BOD_5 and TSS are to be taken from the influent splitter box for discharge from 001 and from the channel ahead of the influent parshall flume for discharge from 01A. Influent samples shall be properly composited in proportion to flow.

The Boulder River shall be monitored at approximately 46º13'34" N latitude, 112º06'44" W longitude, located above the point of discharge of the WWTF effluent as follows:

Parameter	Unit	Frequency	Type
Nitrate + Nitrite, as N	mg/L	1/Month*	Grab
Total Kjeldahl Nitrogen	mg/L	1/Month*	Grab
Total Nitrogen, as N	mg/L	1/Month*	Grab
Total Phosphorus, as P	mg/L	1/Month*	Grab

*Samples required only during the months July, August and September.

Boulder River sample results are to be reported on DMR forms.

Table 9: Monitoring Requirements

Parameter	Unit	Sample Location	Sample Frequency	Sample Type[1]	RRV[2]
Flow	mgd	Effluent	Continuous	Instantaneous	0.001
	mgd	Influent	3/Week	Instantaneous	0.001
Biochemical Oxygen Demand (BOD_5)	mg/L	Influent	3/Week	Composite	10
	mg/L	Effluent	3/Week	Composite	2
	% Removal [3]	NA	1/Month	Calculated	0.1
	lb/day	Effluent	1/Month	Calculated	0.1
Total Suspended Solids (TSS)	mg/L	Influent	3/Week	Composite	10
	mg/L	Effluent	3/Week	Composite	10
	% Removal [3]	NA	1/Month	Calculated	0.1
	lb/day	Effluent	1/Month	Calculated	1
pH	s.u.	Effluent	1/Day	Instantaneous	0.1
Temperature	°F	Effluent	1/Day	Instantaneous	0.1
E. coli[4]	cfu/100ml	Effluent	3/Week	Grab	1
Total Ammonia as N	mg/L	Effluent	1/Week	Composite	0.07
Nitrate + Nitrite as N[5]	mg/L	Effluent	1/Month	Composite	0.02
Total Kjeldahl Nitrogen[5]	mg/L	Effluent	1/Month	Composite	0.5
Total Nitrogen as N[5]	mg/L	Effluent	1/Month	Calculated	0.1
	lb/day	Effluent	1/Month	Calculated	0.1
Total Phosphorus as P[5]	mg/L	Effluent	1/Month	Composite	0.001
	lb/day	Effluent	1/Month	Calculated	0.01
Cadmium, Total Recoverable[6]	µg/L	Effluent	2/Year	Composite	0.03
Copper, Total Recoverable[6]	µg/L	Effluent	2/Year	Composite	0.3
Lead, Total Recoverable[6]	µg/L	Effluent	2/Year	Composite	2
Zinc, Total Recoverable[6]	µg/L	Effluent	2/Year	Composite	8
Arsenic, Total Recoverable[6]	µg/L	Effluent	2/Year	Composite	1
Iron, Total Recoverable[6]	µg/L	Effluent	2/Year	Composite	20
Hardness, Total (as $CaCO_3$)[6]	mg/L	Effluent	2/Year	Grab	10
Oil and Grease[7]	mg/L	Effluent	1/Month	Grab	0.1

Footnotes:

1. See Definition section at end of permit for explanation of terms.
2. RRV is the required reporting value.
3. See narrative discussion in Part IV.E.4 of permit for additional details.
4. Report geometric mean if more than one sample taken during the reporting period. Sampling frequency 1/Month for lagoon discharge through Outfall 001.
5. Monitoring required July 1 through September 30 only. Total Nitrogen is calculated as the sum of Nitrate + Nitrite (as N) plus Total Kjeldahl Nitrogen (as N) concentrations.
6. Metals shall be analyzed as total recoverable; use EPA Method (Section) 4.1.4 [EPA 600/4-79-020, March 1983] or Equivalent. Metals must be analyzed to RRVs of DEQ-7. **One metals sample must be taken during high flow (May 15 – June 15) and one during low flow (September/October).**
7. Use EPA Method 1664, Revision A: N-Hexane Extractable Material (HEM), or equivalent.

b. Sludge Requirements

This permit will contain standard conditions requiring compliance with 40 CFR 503 for any removal or disposal of biosolids from the WWTF.

c. Pretreatment Program

The facility is not currently operating under an approved Pretreatment Program. The permit will include standard language restricting introducing certain pollutants to the Boulder WWTF and requiring the facility to provide adequate notice to the Department if a new source, volume or character of industrial pollutant is introduced to the system.

VII. Nonsignificance Determination

The facility must meet previous permit final limits for BOD_5, TSS, *E. coli*, and pH in the proposed permit renewal for discharge from 001. For discharge from 01A, the 001 limits apply except the concentration limits on TSS have been reduced to the national secondary treatment standards and the load limits on BOD_5 and TSS have been recalculated lower based on a lower design capacity in the new activated sludge WWTF. The limits for discharge from 01A also contain the requirement to remove 85% of influent BOD_5 and TSS. The limit on TRC has been eliminated because effluent disinfection will be accomplished with UV treatment. The total ammonia-N limits have been lowered for discharges from 001 and 01A in the permit as a result of additional in-stream monitoring data. Interim general variance limits on TN and TP have been included for discharges from each 001 and 01A because monitoring and RP analyses showed reasonable potential to exceed water quality standards. Final TN and TP limits, effective August 2034, have been included for the discharge from 01A. A temperature limit has been applied to 01A to comply with the temperature WLA developed in Sed/N/Temp TMDLs.

DEQ has determined that the discharge does not constitute a new or increased source of pollutants pursuant to ARM 17.30.702(18). Therefore, a nonsignificance analysis is not required [ARM 17.30.705(1)].

VIII. Compliance Schedules and Special Conditions

No compliance schedules are included in this permit, although August 2034 has been established for compliance with final effluent limits on TN and TP.

IX. Other Information

On September 21, 2000, a U.S. District Judge issued an order stating that until all necessary total maximum daily loads (TMDLs) under Section 303(d) of the Clean Water Act are established for a particular water quality limited segment (WQLS), the State is not to issue any new permits or increases under the MPDES program. The order was issued in the Friends of the Wild Swan v. U.S. EPA, *et. al.* (CV 97-35-M-DWM), District of Montana and Missoula Division.

The Department finds that issuance of this permit renewal does not conflict with Judge Molloy's Order (CV 97-35-M-DWM) because the permitted discharge does not represent a new or increased source of pollutants and the WLAs of the completed TMDLs for metals, sediment and temperature for the Boulder River have been incorporated into the permit (see Section IV(e)(2)of this SOB).

X. Information Sources

a. Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. §§ 1251-1387, October 18, 1972, as amended 1973-1983, 1987, 1988, 1990-1992, 1994, 1995 and 1996.

b. US Code of Federal Regulations, 40 CFR Parts 122-125, 130-133, & 136.

c. Montana Code Annotated (MCA), Title 75-5-101, *et seq*., "Montana Water Quality Act," 2011.

d. Administrative Rules of Montana Title 17 Chapter 30 - Water Quality
   Subchapter 2 - Water Quality Permit and Application Fees, June 2011.
   Subchapter 5 - Mixing Zones in Surface and Ground Water, September 2010.
   Subchapter 6 - Montana Surface Water Quality Standards and Procedures, December 2012.
   Subchapter 7- Nondegradation of Water Quality, September 2010.
   Subchapter 12 - Montana Pollutant Discharge Elimination System (MPDES) Standards, December 2011.
   Subchapter 13 - MPDES Permits, June 2013.

e. Montana DEQ Circular DEQ-7, Montana Numeric Water Quality Standards, October 2012.

f. Integrated 303(d)/305(b) Water Quality Report for Montana (1996, and 2014).

g. US Department of Interior Geological Survey, Statistical Summaries of Streamflow in Montana and Adjacent Areas, Water Years 1900 through 2002, Scientific Investigations Report 2004-5266, 2004.

h. US EPA Technical Support Document for Water Quality-Based Toxics Control, EPA/505/2-30-001, March 1991.

i. US EPA National Pollutant Discharge Elimination System (NPDES) Permit Writers' Manual, EPA 833-K-10-001, September 2010.

j. MPDES Permit Number MT0023078:
   1. Administrative Record.
   2. Renewal Application DEQ Form 1 and EPA Form 2A, May 2014.

k. Montana Department of Fish, Wildlife and Parks, Don Skaar, Spawning Times of Montana Fishes, March 2001.

l. Montana Fisheries Information System (MFISH).

m. Montana DEQ Circular DEQ-12A, Montana Base Numeric Nutrient Standards, July 2014.

n. Montana DEQ Circular DEQ-12B, Nutrient Standards Variances, July 2014.

o. Montana DEQ, Final Boulder-Elkhorn Metals TMDLs and Framework Water Quality Improvement Plan, 2012.

p. Montana DEQ, Sediment, Nutrients, and Temperature TMDLs and Water Quality Improvement Plans for the Boulder-Elkhorn Planning Area, 2013.

SOB Prepared By: James F. Brown, December 2014

Appendix A: Reasonable Potential & Effluent Limit Calculations: NH_3-N

$C_{rp} = [C_eQ_e + C_sQ_s] / [Q_e + Q_s]$ & $C_e = C_{rp}[(Q_e + Q_s) - C_sQ_s] / Q_e$

Where:
C_{rp} = receiving water concentration after mixing, mg/L
C_e = effluent concentration, mg/L
C_s = receiving water concentration upstream of discharge, mg/L
Q_e = facility design flow rate, mgd
Q_s = applicable receiving water flow, 10% of 7Q10 (chronic), 1% of 7Q10 (acute), mgd

Reasonable Potential Calculations:
from DMRs (38 mo): Max Rpd – 21.0 mg/L; calc. CV – 0.85; EPA TSD Table 3.2 mult. – 1.5
C_e = 31.5 mg/L; C_s = 0.05 mg/L; Q_e = 0.25 mgd; Q_{s10} = 0.4 mgd; Q_{s1} = 0.04 mgd
Chronic WQS – 5.08 mg/L; Acute WQS – 17.5 mg/L

Chronic:
$C_{rp} = [(31.5)(0.25) + (0.05)(0.4)] / [0.25 + 0.4] = 7.9 / 0.65 = 12.2$ mg/L > 5.08 mg/L N.G.

Acute:
$C_{rp} = [(31.5)(0.25) + (0.05)(0.04)] / [0.25 + 0.04] = 7.9 / 0.29 = 27.2$ mg/L > 17.5 mg/L N.G.

Reasonable Potential for exceeding water quality standards for NH_3-N exists for chronic and acute.

Effluent Limit Calculations:

Chronic:

$C_e = [(5.08)(0.25 + 0.4) – (0.05)(0.4)] / 0.25 = 3.3 / 0.25 = 13.2$ mg/L $WLA_{chronic}$

Acute:

$C_e = [(17.5)(0.25 + 0.04) – (0.05)(0.04)] / 0.25 = 5.1 / 0.25 = 20.4$ mg/L WLA_{acute}

from EPA TSD:
for assumed CV of 0.6; 4 samples/mo; WLA @ 99%; MDL @ 99%; AML @ 95%

from Table 5.1 – acute WLA multiplier = 0.321; chronic WLA multiplier = 0.527
from Table 5.2 – MDL multiplier = 3.11; AML multiplier = 1.55

$LTA_{chronic} = (13.2)(0.527) = 7.0$ mg/L; $LTA_{acute} = (20.4)(0.321) = 6.5$ mg/L acute controls

MDL = (6.5)(3.11) = 20.2 mg/L; AML = (6.5)(1.55) = 10.1 mg/L

Appendix B: Reasonable Potential & Effluent Limit Calculations: TN

$C_{rp} = [C_eQ_e + C_sQ_s] / [Q_e + Q_s]$ & $C_e = C_{rp}[(Q_e + Q_s) - C_sQ_s] / Q_e$

Where:
C_{rp} = receiving water concentration after mixing, mg/L
C_e = effluent concentration, mg/L
C_s = receiving water concentration upstream of discharge, mg/L
Q_e = facility design flow rate, mgd
Q_s = applicable receiving water flow, Seasonal (July-October) 14Q5, mgd

Reasonable Potential Calculations:
from DMRs (8 mo): Max Rpd – 14.8 mg/L; calculated CV – 0.4
EPA TSD Table 3.2 mult. – 1.6
C_e = 23.7 mg/L; C_s = 0.165 mg/L; Q_e = 0.18 mgd; Q_{s14Q5} = 5.9 mgd
Chronic WQS – 300 µg/L (0.300 mg/L)

Chronic:
$C_{rp} = [(23.7)(0.18) + (0.165)(5.9)] / [0.18 + 5.9] = 5.24 / 6.08 = 0.860$ mg/L > 0.300 mg/L N.G.

Reasonable Potential for exceeding water quality standards for TN exists.

Effluent Limit Calculations:

Chronic:

$C_e = [(0.3)(0.18 + 5.9) – (0.165)(5.9)] / 0.18 = 0.85 / 0.18 = 4.7$ mg/L $WLA_{chronic}$

from EPA TSD:
for calculated CV of 0.4; 4 samples/mo; WLA @ 95%; AML @ 95%

from Table 5.1 – chronic WLA multiplier = 0.736
from Table 5.2 – AML multiplier = 1.36

$LTA_{chronic} = (4.7)(0.736) = 3.5$ mg/L

AML = (3.5)(1.36) = 4.8 mg/L

@ activated sludge WWTF design flow of 0.18 mgd;

$AML_{LOAD} = (4.8)(0.18)(8.34) = 7.2$ lbs/day

Appendix C: Reasonable Potential & Effluent Limit Calculations: TP

$C_{rp} = [C_eQ_e + C_sQ_s] / [Q_e + Q_s]$ & $C_e = C_{rp}[(Q_e + Q_s) - C_sQ_s] / Q_e$

Where:
C_{rp} = receiving water concentration after mixing, mg/L
C_e = effluent concentration, mg/L
C_s = receiving water concentration upstream of discharge, mg/L
Q_e = facility design flow rate, mgd
Q_s = applicable receiving water flow, Seasonal (July-October) 14Q5, mgd

Reasonable Potential Calculations:
from DMRs (8 mo): Max Rpd – 4.87 mg/L; calculated CV – 0.5
EPA TSD Table 3.2 multiplier – 1.7
C_e = 8.28 mg/L; C_s = 0.023 mg/L; Q_e = 0.18 mgd; Q_{s14Q5} = 5.9 mgd
Chronic WQS – 30 µg/L (0.030 mg/L)

Chronic:
$C_{rp} = [(8.28)(0.18) + (0.023)(5.9)] / [0.18 + 5.9] = 1.63 / 6.08 = 0.268$ mg/L > 0.030 mg/L N.G.

Reasonable Potential for exceeding water quality standards for TP exists.

Effluent Limit Calculations:

Chronic:

$C_e = [(0.03)(0.18 + 5.9) – (0.023)(5.9)] / 0.18 = 0.047 / 0.18 = 0.261$ mg/L $WLA_{chronic}$

from WPA TSD:
for calculated CV of 0.5; 4 samples/mo; WLA @ 95%; AML @ 95%

from Table 5.1 – chronic WLA mult. = 0.687
from Table 5.2 – AML mult. = 1.45

$LTA_{chronic} = (0.261)(0.687) = 0.179$ mg/L

AML = (0.179)(1.45) = 0.26 mg/L

@ activated sludge WWTF design flow of 0.18 mgd;

$AML_{LOAD} = (0.26)(0.18)(8.34) = 0.39$ lbs/day

Appendix D: (Interim) General Variance Nutrient Limits Calculations

Month	Year	Total N mg/L	Total P mg/L
June	2010	41.9	4.37
Sept	2010	5.5	2.91
June	2011	10.8	3.62
Sept	2011	3.4	0.85
June	2012	8.5	4.20
Sept	2012	5.3	3.64
June	2013	11.5	2.57
Sept	2013	11.8	4.87
June	2014	14.8	0.68
Sept	2014	5.3	3.64
Long Term Averages (LTA)		11.9	3.14
Standard Deviation		11.2	1.4
Calculated CV		0.9	0.45
From EPA TSD Table 5.2:			
LTA Multiplier (95th Percentile, n = 4)		1.85	1.40
Average Monthly Limit (AML) Calculations:			
AML [conc.] = (LTA)(LTA Multiplier)		22.0	4.40

General variance nutrient limits for lagoons are expressed in terms of load only, based on the design flow of the WWTF.

@ lagoon system WWTF design flow of 0.25 mgd;

$AML_{TN} = (22.0)(0.25)(8.34) = 45.9$ lbs/day

$AML_{TP} = (4.40)(0.25)(8.34) = 9.2$ lbs/day